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METHOD OF TEST FOR LUMINAIRE ISOLUX DIAGRAMS

CAUTION: Prior to handling test materials, performing equipment setups, and/or conducting this method, testers are required to read **"SAFETY AND HEALTH"** in Section D of this method. It is the responsibility of whoever uses this method to consult and use departmental safety and health practices and determine the applicability of regulatory limitations before any testing is performed. Users of this method do so at their own risk.

A. SCOPE

The objective of this test is to obtain the light distribution plot for luminaires. A luminaire is rotated while suspended from the ceiling of a photometric tunnel and the illumination is recorded and plotted. A typical tunnel is flat black in color, and has dimensions of 40 m long, 3.5 m high, and 3.5 m wide. Corrections shall be made to compensate for mounting height and lamp lumen output.

B. APPARATUS

Typical

1. Photo Research Photometer, Model PR-302.
2. Weston voltmeter, Model 433.
3. Fluke Digital Multimeter, Model 8060A.
4. Sylvania variable linear reactor (Type 20758).
5. Power Supply (0→480v).
6. Rotational servo unit (attached to tunnel ceiling).
7. Reference lamp that meets ANSI Specification C78.

C. TEST PROCEDURE

1. Setup. Using a ladder, mount the luminaire (with its shield in place) on the servo extension arm and position the luminaire so the rotational axis of the servo passes directly through the lamp center (see Figures 1 and 2).
2. Leveling. Level the luminaire as specified by the manufacturer.
3. Reactor Adjustment. Adjust the variable reactor to the proper impedance by wiring it with the voltmeter and ammeter (as shown in Figure 3a) with the switch closed. Find the impedance value for each type of mercury lamp in the ANSI Standard C78 along with the proper lamp current. Using Ohm's law, derive an input voltage. Apply this voltage and adjust the reactor until the proper current is obtained.
4. Wiring. Wire the luminaire with the reactor and meters as shown in Figure 3a and 3b. Two reactors may be required, depending upon lamp requirements, to attain the proper impedance.
5. Lamp Positioning. Insert the reference lamp, making note of the lamp resistor

position because lumen output varies in different lamp orientations. Measure the vertical distance between the lamp center and the lightmeter photocell. Label this distance as "A" in Figure 1.

6. Warm-up. Close the luminaire door and turn on the power. Adjust the input voltage to the required value, and allow the lamp to warm up for 15 minutes.

7. Final Adjustments. After the lamp has stabilized, the wattage is adjusted to produce 22,000 lumens with 200-watt lamps or 37,000 lumens with 310-watt lamps. An alternate method is operating the lamp at rated wattage and making the adjustment from actual lumens to design lumens in the calculations. Close the tunnel doors and turn off all other light sources.

8. Testing. Operator #1 initially sets the lightmeter to a precalculated value (see Appendix) while operator #2 sets the servo at 0^0 to point the luminaire directly in line with the tunnel. Operator #1 then pulls the cart along the length of the tunnel, riding astride a cloth tape from which a distance is read when the meter nulls. Operator # 2 records that distance, and then advances the luminaire 10^0. Continue this procedure until 360^0 has been covered, and then repeat it for other pre-calculated light intensities. Correct the data obtained for mounting height deviation by multiplying each value by a correction factor (see Appendix). Plot these values on special graph paper.

9. Glare Test (Required only for Semi Cutoff Luminaires). Place the Spectra Brightness Meter 32 m down the tunnel from the luminaire. Adjust the meter tripod to obtain a 2 m vertical distance between the luminaire and the meter. This is accomplished by measuring the distance A (Figure 1) and subtracting 2 m to obtain the meter height. The luminaire is mounted at an angle of 3 degrees 35 minutes from the meter. Aim the meter at the luminaire and measure the brightness in Candela/m^2 at both the 90^0 and 270^0 servo positions.

10. Final Results. Average the two glare values and compare with standard specifications. Place a transparent overlay of a minimum isolux plot over the test plot and compare.

D. SAFETY AND HEALTH

Prior to handling, testing or disposing of any waste materials, testers are required to read: Part A (Section 5.0), Part B (Sections: 5.0, 6.0 and 10.0) and Part C (Section 1.0) of Caltrans Laboratory Safety Manual.

Users of this method do so at their own risk.

REFERENCES:

ANSI Standard C78
California Standard Specifications

End of Test (California Test 678 contains 6 pages)

APPENDIX

CORRECTIONAL EQUATIONS

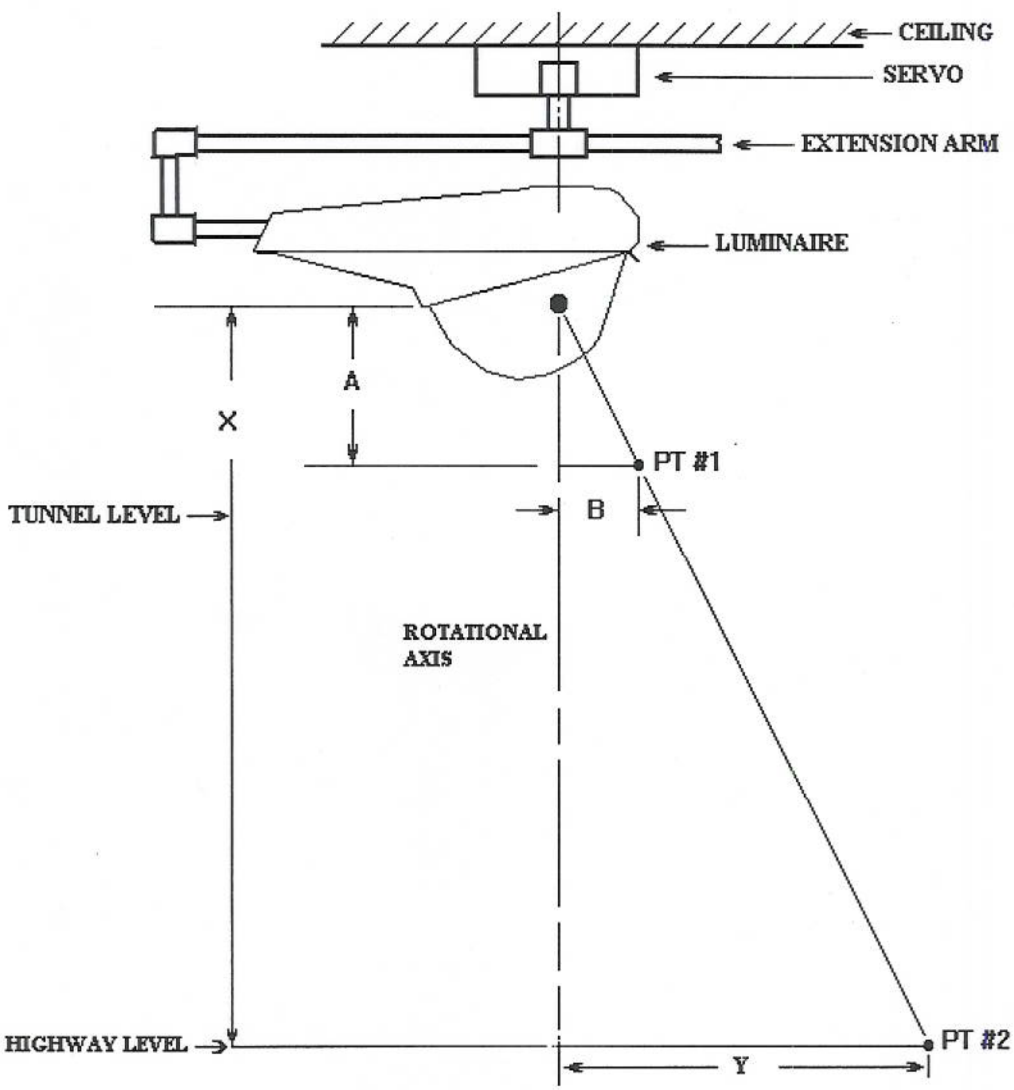
Note: Equations in reference to Figure 1

1. Footcandles read at cart = (Intended Isolux Footcandles) (design height/tunnel height)^2 (actual lumen/design lumen)

   Cart lux. = (F. C. x 10.764) $(X/a)^2$ (actual lumen/design lumen)

2. Highway horizontal distance = (tunnel horizontal distance) (design height/tunnel height)

   Distance = (Data) (X/A)



A = VERTICAL MOUNTING HEIGHT OF LUMINAIRE IN TUNNEL
B = HORIZONTAL DISTANCE BETWEEN ROTATIONAL AXIS AND PHOTOCELL POSITION AT POINT 1.
X = VERTICAL MOUNTING HEIGHT OF LUMINAIRE ON HIGHWAY
Y = HORIZONTAL DISTANCE BETWEEN ROTATIONAL AXIS AND ISOLUX POSITION AT POINT 2.

FIGURE 1

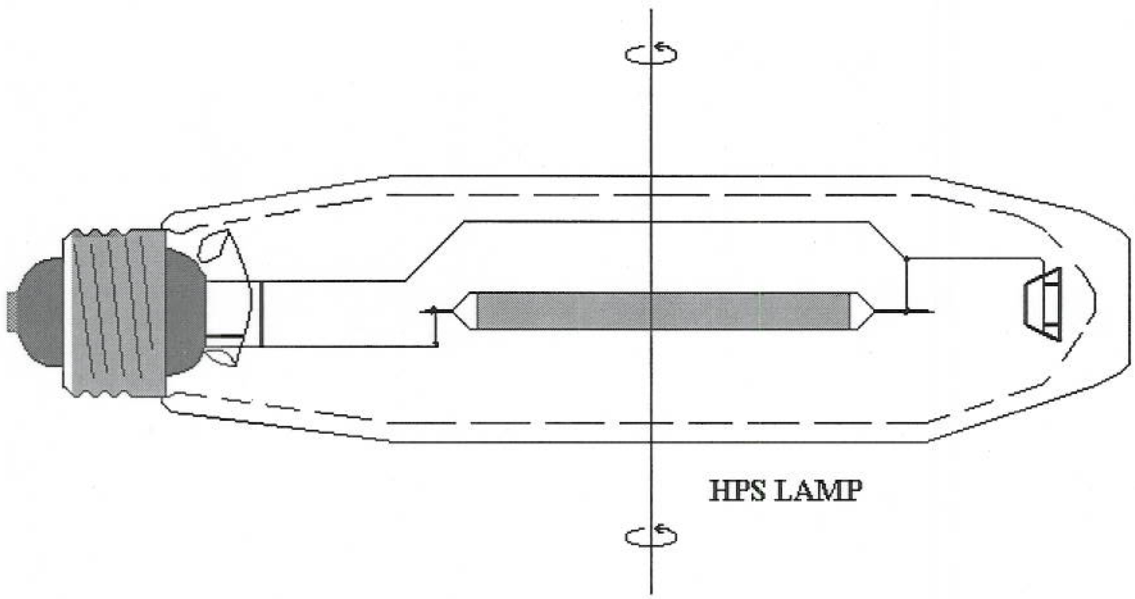


FIGURE 2
HPS LAMP

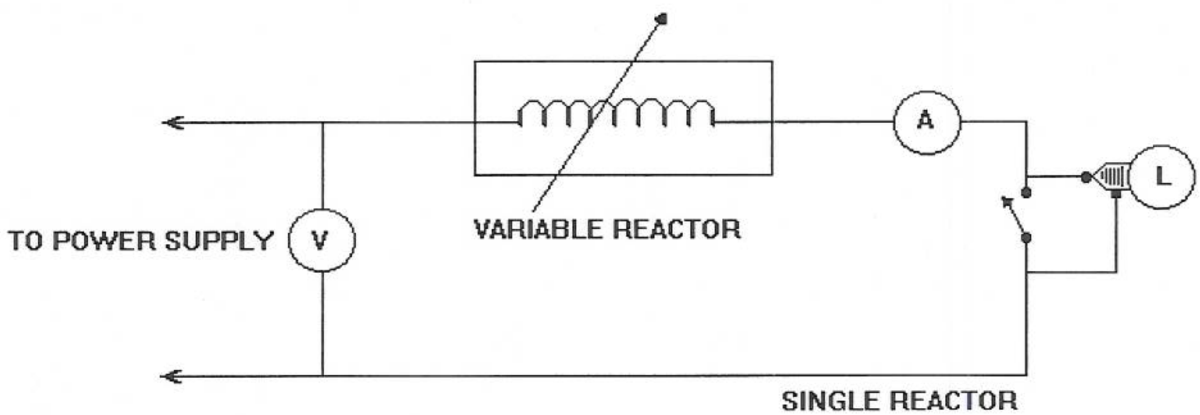


FIGURE 3A
SINGLE REACTOR

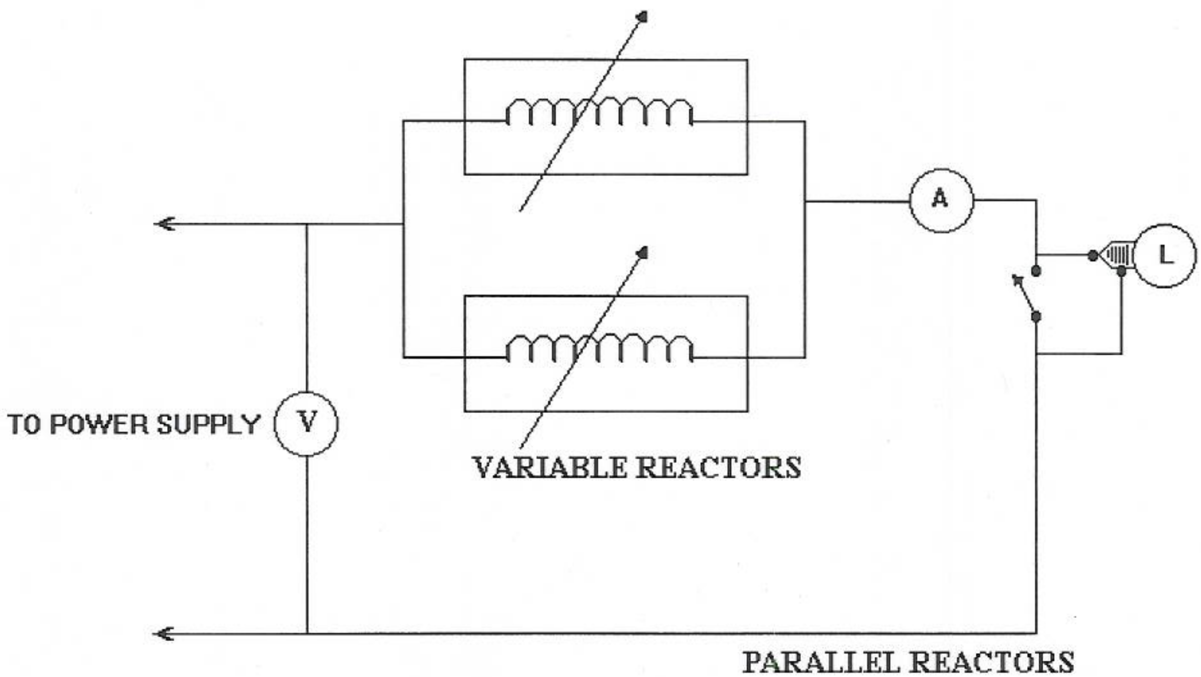


FIGURE 3B
PARALLEL REACTORS